SEDIMENT DIVERSION EFFICIENCY,
LESSONS LEARNED FROM MISSISSIPPI RIVER MODELS

Ronnie Heath, Ronald.E.Heath@usace.army.mil, Gary Brown, Gary.L.Brown@usace.army.mil, and Jeremy Sharp, Jeremy.A.Sharp@usace.army.mil,
Research Civil Engineers, U. S. Army Corps of Engineers, Engineer Research and Development Center, Coastal and Hydraulics Laboratory, Vicksburg, Mississippi.

ABSTRACT

Large scale diversions of sediment and water from the Mississippi River have been proposed as a means to restore valuable wetlands along the Louisiana coast (CRPA 2012). Successful design and operation of diversions requires that diverted water volumes and sediment loads be carefully balanced to maintain channel stability and to achieve restoration goals. In general, diversions reduce sediment transport capacity in the river downstream of the withdrawal, and disproportionally large diversions of bed material are required to balance this reduction. In the Mississippi River, deposition induced by insufficient sediment diversions may impact other authorized project purposes such as navigation and flood control.

Sediment diversions are defined in the HEC-6 one-dimensional sedimentation model by coefficients defining the fractions of water and sediment diverted from the river (USACE, 1993). The sediment diversion coefficient, $k_{SD}$, the ratio of the diverted sediment concentration, $C$, to the ambient concentration in the river (equation 1), describes the efficiency of the sediment diversion and is proposed as the basis for metrics suitable for comparing diversion alternatives and informing design and operation planning.\(^1\) For computational purposes, the coefficient also may be defined in terms of water discharge, $Q$, and sediment load, $Q_S$. While the sediment diversion coefficient is conceptually simple, its application and estimation can be complex and challenging.

$$k_{SD} = \frac{C_{\text{Diversion}}}{C_{\text{River}}} = \left(\frac{Q_S}{Q}\right)_{\text{Diversion}} = \left(\frac{Q_S}{Q}\right)_{\text{River}}$$

The U. S. Army Engineer Research and Development Center’s (ERDC) Coastal and Hydraulics Laboratory (CHL) has conducted model studies ranging from analytical models (Letter et al. 2008 and Brown et al. 2013) to estimate equilibrium sediment diversion efficiencies to multi-dimensional model studies of the West Bay Sediment Diversion (Sharp et al. 2013) and the Old River Control Complex to gain insight into the behavior and impacts of existing diversions. The CHL is currently working with the U. S. Army Corps of Engineers New Orleans District and the

\(^1\) Closely related variations on the sediment diversion coefficient appearing in the literature include the water-sediment ratio, concentration ratio, and sediment diversion ratio.
State of Louisiana to conduct a comprehensive evaluation of proposed sediment diversions from the Mississippi River to restore coastal wetlands.

REFERENCES

http://acwc.sdp.sirsi.net/client/search/asset/1030340

http://coastal.la.gov/a-common-vision/2012-coastal-master-plan/

